

Claims:

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1. A method of fabricating an organic light-emitting device, which method comprises the steps of:

forming a first electrode for the device over a substrate;

either forming by self-assembly at least one polymer layer over the first electrode and forming other than by self-assembly at least one layer of organic light emissive material over the at least one polymer layer; and forming a second electrode for the device over the at least one layer of organic light emissive material;

or forming other than by self-assembly at least one layer of organic light emissive material over the first electrode and forming by self-assembly at least one polymer layer over the at least one layer of organic light emissive material; and forming a second electrode for the device over the at least one polymer layer.

2. A method according to claim 1, which method further comprises removing physisorbed water from the surface of the substrate prior to forming the at least one polymer layer.

3. A method according to claim 2, wherein the physisorbed water is removed by heating.

4. A method according to ^{claim 1} ~~any preceding claim~~ which method further comprises forming a coupling layer prior to forming the at least one polymer layer.

5. A method according to claim 4, wherein the coupling layer is formed by silylating the substrate.

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A 6. A method according to ^{claim 1} ~~any preceding claim~~, which method further comprises preparing the substrate surface such that the surface charge of the substrate is pH independent.

A 7. A method according to ^{claim 1} ~~any preceding claim~~, wherein when the substrate comprises amino groups, the method further comprises quaternising amino groups to form positively charged quaternised species on the surface.

A 8. A method according to ^{claim 1} ~~any preceding claim~~, wherein when the substrate comprises thiol groups, the method further comprises the step of oxidising thiol groups to form negatively charged species on the surface.

A 9. A method according to ^{claim 1} ~~any preceding claim~~, wherein the substrate comprises a glass, or a plastics material.

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10. A method according to claim 9, wherein the plastics material comprises one or more of a polyester, a polycarbonate or a poly(ether amide).

A 11. A method according to ^{claim 1} ~~any preceding claim~~, wherein the at least one self-assembled polymer layer comprises one or more pairs of co-operating sub-layers.

12. A method according to claim 11, wherein the one or more pairs of co-operating sub-layers interact by attractive forces, each sub-layer being dissimilar to the other.

13. A method according to claim 12, wherein one sub-layer of a pair is negatively charged and the other sub-layer of the pair is positively charged.

14. A method according to claim 11, wherein the one or more pairs of co-operating sub-layers interact by donor/acceptor

interaction.

15. A method according to claim 14, wherein the donor/acceptor interaction is provided by hydrogen bonding.

~~A 16. A method according to ^{claim 1}any of claims 11-15, wherein each sub-layer of the co-operating pairs of sub-layers is 0.3-2 nm thick.~~

~~A 17. A method according to ^{claim 1}any preceding claim, wherein the at least one polymer layer is 0.3-20 nm thick.~~

~~A 18. A method according to ^{claim 1}any preceding claim, wherein the organic material comprises a conjugated polymer and/or a low molecular weight compound.~~

19. A method according to claim 18, wherein the organic material comprises a semiconductive conjugated polymer

20. A method according to claim 19, wherein the organic material comprises PPV or a derivative thereof.

~~A 21. A method according to ^{claim 1}any preceding claim, wherein the at least one layer of organic light-emissive material is 30-1000 nm thick.~~

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~~22. A method of fabricating an organic light-emitting device which method comprises the steps of:~~

~~forming a first electrode for the device over a substrate;~~

~~either removing physisorbed water from the surface of the first electrode, forming a coupling layer, forming, by self-assembly, at least one polymer layer over the first electrode, and forming at least one layer of organic light emissive material over the at least one polymer layer;~~

~~or forming at least one layer of organic light emissive material~~

over the first electrode, removing physisorbed water from the surface of the at least one organic light-emissive material, forming a coupling layer, and forming, by self-assembly, at least one polymer layer over the at least one layer of light emissive material; and

forming a second electrode for the device over the at least one layer of light emissive material.

- A 23. A method according to ^{claim 22} ~~any preceding claim~~, wherein the at least one polymer layer has an electronic and/or optical property that varies across the thickness of the layer.

24. A method according to claim 23, which method additionally comprises the step of processing the at least one polymer layer to form the spatial variation in the electronic and/or optical property.

25. A method according to claim 24, wherein the at least one polymer layer comprises a conjugated material and the step of forming the spatial variation in the electronic and/or optical property comprises reducing the degree of conjugation of the conjugated material.

Sub 34 26. A method according to claim 24 ~~or claim 25~~, wherein the step of processing the at least one polymer layer comprises exposing the polymer layer to a reactive agent to promote a chemical reaction in the transport layer.

27. A method according to claim 26, wherein the reaction is an oxidation or reduction reaction.

- A 28. A method according to claim 26 ~~or claim 27~~, wherein the reactive agent is an oxidising agent.

- claim 26
- A 29. A method according to ~~any of claims 26-28~~, wherein the agent is oxygen.
- claim 26
- A 30. A method according to ~~any of claims 26-29~~, wherein the agent is in the form of a plasma.
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31. A method according to claim 23, wherein the step of forming the at least one polymer layer comprises forming the polymer layer in a state in which the electronic and/or optical property varies across its thickness.
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32. A method according to claim 31, wherein the polymer layer is deposited in a series of sub-layers.
- A 33. A method according to claim 31 ~~or claim 32~~, wherein the polymer layer is deposited in the form of a series of bilayers each containing two sub-layers of different materials.
- claim 33
- A 34. A method according to ~~any of claims 31-33~~, wherein the polymer layer is deposited so as to comprise a series of sub-layers of a material which each differ in the electronic and/or optical property.
35. A method according to claim 34, wherein the sub-layers of a material are graded in the said property across the thickness of the polymer layer.
- A 36. A method according to claim 34 ~~or claim 35~~, wherein the material comprises poly(styrenesulphonic acid).
- claim 34
- A 37. A method according to ~~any of claims 34-36~~, wherein the sub-layers are doped so as to achieve the difference in the electronic and/or optical property.
- A 38. A method according to claim 36 ~~or claim 37~~, wherein in at

least some of the sub-layers the poly(styrenesulphonic acid) is doped with poly(ethylenedioxythiophene).

^{claim 23}
A 39. A method according to ~~any of claims 23-38~~, wherein said property is an energy level or an energy level distribution.

40. A method according to claim 39, wherein said property is ionisation potential.

^{claim 23}
A 41. A method according to ~~any of claims 23-40~~, wherein in a direction from the first electrode to the light emissive layer the ionisation potential of the polymer layer varies away from the conduction band of the first electrode.

^{claim 23}
A 42. A method according to ~~any of claims 23-41~~, wherein in a direction from the first electrode to the light emissive layer the ionisation potential of the polymer layer varies towards the HOMO level of the light emissive layer.

^{claim 23}
A 43. A method according to ~~any of claims 23-42~~, wherein the optical gap of the light emissive layer varies in a direction from the first electrode to the second electrode.

44. A method of preparing a surface having a pH dependent surface charge prior to self-assembly, which method comprises the step of treating the surface such that the surface charge is pH independent.

45. A method of preparing a surface comprising amino groups prior to self-assembly, which method comprises the step of quaternising the amino groups.

46. A method of preparing a surface comprising thiol groups prior to self-assembly, which method comprises the step of oxidising the thiol groups.

47. An organic light emitting device, obtainable according to a method as defined in any preceding claim.

48. An organic light emitting device comprising: at least one layer of organic light-emissive material between a first electrode and a second electrode, the at least one organic light-emissive material (having been formed other than by self-assembly); and at least one polymer layer between one of the first and second electrodes and the at least one organic light-emissive material, the at least one polymer layer being formed by self-assembly.

49. An organic light emitting device according to claim 48, wherein the at least one polymer layer has an electronic and/or optical property that varies across the thickness of the layer.

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